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Sampling and Analysis Plan for Ground Water Contamination Investigation, I-70, 44th Street to Brighton Boulevard, City and County of Denver, Colorado

WALSH Project Number: 3026-010
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Walsh

Environmental Scientists and Engineers, Inc.

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SAMPLING AND ANALYSIS PLAN FOR GROUND WATER CONTAMINATON INVESTIGATION, I-70, 44TH STREET TO BRIGHTON BOULEVARD, CITY AND COUNTY OF DENVER, COLORADO

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SAMPLING AND ANALYSIS PLAN ˆOR GROUND WATER CONTAMINATON INVESTIGATION, -70, 44TH STREET TO BRIGHTON BOULEVARD, CITY AND COUNTY OF DENVER

INTRODUCTION

lsh Environmental Scientists and Engineers, Inc. (WALSH) has been contracted by the orado Department of Transportation (CDOT) to conduct a supplemental ground water :stigation in the study area. The purpose of the investigation is to identify potential sources :hlorinated solvent contamination discovered during Phase II Site Investigation activities ıg I-70 from Washington Street to High Street in Denver, Colorado (CDOT Project No. IR-CX)070-4(145)). This study will further delineate ground water contamination detected ıng earlier studies of the I-70 corridor from Washington Street to Brighton Boulevard ㄟLSH, 1991a, 1991b, 1992, 1996 and 1998. The investigation is intended to determine :ther chlorinated solvent contamination in ground water originates within present or future OT right-of-way, or has migrated from unknown up gradient sources.

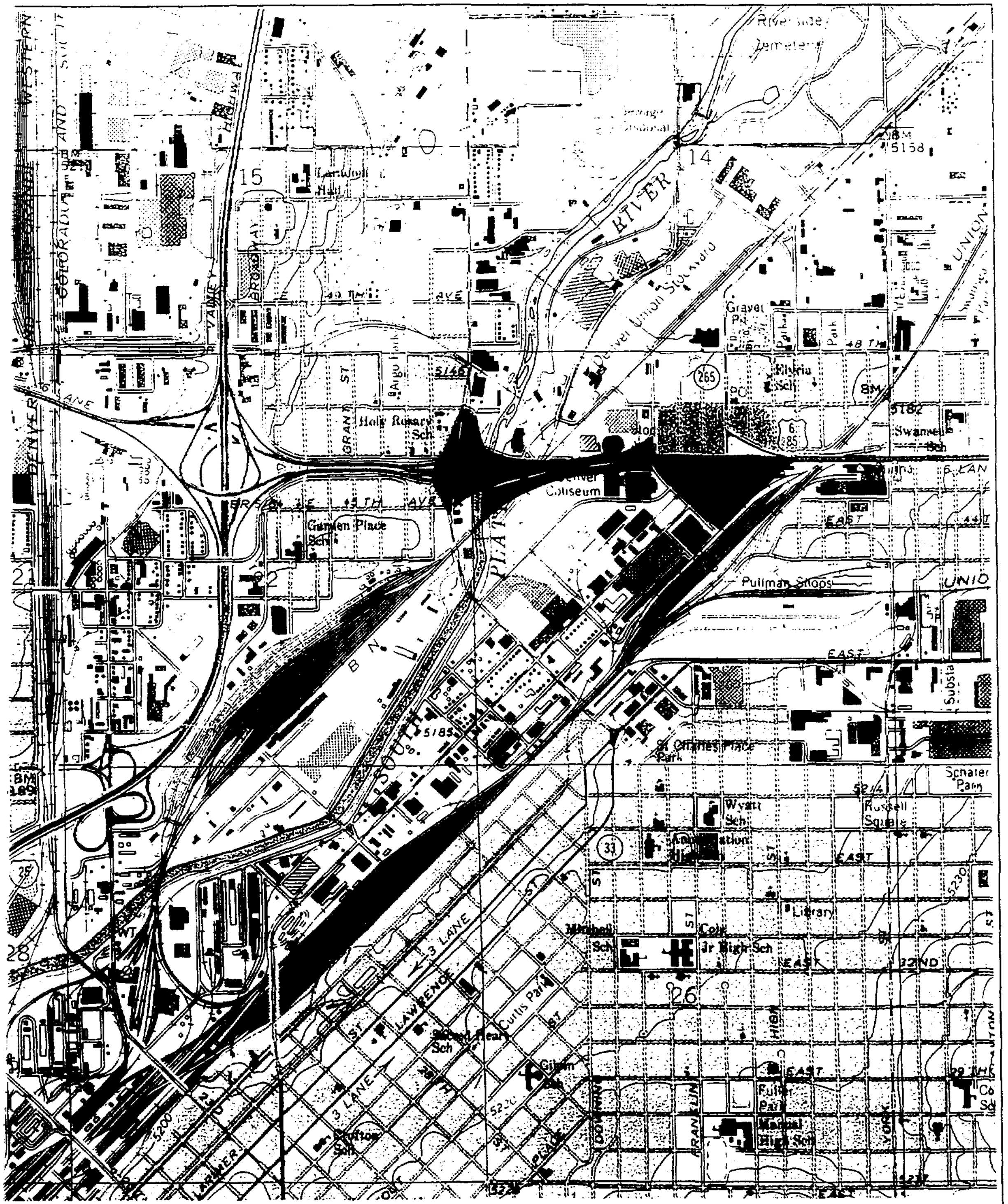
: objectives of this Site Investigation include assessing the current status of ground water lution and identifying possible onsite or offsite sources of chlorinated solvents (primarily achloroethene). Goals include identifying the need for remedial action and potential ·ironmental liability associated with future right-of-way acquisition. Special handling and ›osal may also be required for excavated soil, or where construction activities encounter ıtaminated ground water. Construction worker and public health and safety issues identified this investigation will be discussed under a Materials Management Plan (MMP) issued when analytical results of this investigation are available.

PROPOSED CONSTRUCTION AND PROPERTY ACQUISITION

: CDOT is replacing the elevated portion of I-70 from Washington Street to Brighton ulevard with a wider, elevated highway (see Figure 2). Existing ramps at Humboldt Street l be removed and replaced with interchanges constructed at Washington Street and Brighton ulevard. The existing elevated structure east of Humboldt Street will be replaced, and fill terial will be used to support I-70 east of Humboldt Street.

sign plans indicate that property acquisition is required for the widening of I-70, the lening of Washington Street, and the relocations of 46th Avenue and Brighton Boulevard. e Union Pacific Railroad (UPRR) tracks (south of I-70 at Brighton Boulevard) will be ›ved southward to accommodate proposed ramp structures. Construction of retaining walls, :ssons, storm/sanitary sewers, and other utility relocations will require excavation at various :ations in the project area.

re 1 VICINITY MAP



Approximate Map Scale: 1: 15,000

Map Source: USGS Commerce Quadrangle
Colorado, 7.5 Min. Series (topographic) 1959
Revised 1980

Site

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Site Vicinity Topographical Map

Job 3026-010	Date 4/99	Figure 1

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REGIONAL SETTING

Location

area investigated is located within the City and County of Denver, Colorado and is shown igure 1. The initial phase of the construction will involve the widening of the eastbound ; of I-70 from Washington Street to Humboldt Street. Properties affected by the Phase Ian e II construction activities were evaluated in WALSH, 1997and 1998. Properties included ıis investigation are located between 44th Street and Brighton Boulevard, south of I-70. properties to be sampled have been or will be acquired by CDOT. Construction activities extend ramps away from I-70 and into existing neighborhoods and commercial areas oximately bounded by 44th Street and Brighton Boulevard on the south and 47th Avenue ıe north. The UPRR tracks will be relocated south of their present position.

Physiography and Geology

project area is located in the Denver Basin, east of the Front Range Uplift of the Southern :y Mountains. Topographically the area is generally flat with elevations decreasing rds the South Platte River (Figure 1). Surface drainage is towards the South Platte River. project area is covered by a thin veneer of unconsolidated sediments which include the dway Alluvium (Quaternary) and the Post Piney Creek Alluvium (Holocene). These nents are generally poorly sorted sands, gravels and some clays. Flat lying bedrock of the aceous/Tertiary Denver Formation, consisting of weathered shale, siltstone, and fine stone, is unconformably overlain by the younger unconsolidated sediments. Depth to the latory bedrock surface near I-70 and east of Humboldt Street is approximately 45 feet ıirre, 1995).

top of the Denver Formation marks the base of the unconfined aquifer. Depth to ground r is expected to be approximately 27 to 34 feet below ground surface in the vicinity of boldt Street and Brighton Boulevard (WALSH, 1991b,1992 and Aguirre, 1995). Local nfined ground water flow, east of the South Platte River is to the northwest (WALSH, b). Ground water flow velocities were estimated to vary between 20 and 200 feet per within the study area (WALSH, 1996). More details of the local geology and ground r conditions are found in the various WALSH reports (1991b, 1992, 1996,1997, and) and the geotechnical report by Aguirre (1995).

REVIEW OF EARLIER ENVIRONMENTAL INVESTIGATIONS

e II and III of the modifications to I-70 between Humboldt Street and Brighton Boulevard ›rse a commercial, industrial and residential area where many environmental concerns been identified. Several properties of concern were identified between 44th Street and ghton Boulevard in 1991 and 1992 (WALSH, 1991a, 1991b, and 1992), including nine perties with known or suspected USTs. This study was expanded in July 1991 to include I-70 corridor from Washington Street to Brighton Boulevard and was revised in late 1996. ·se reports identified four main categories of environmental concern: petroleum taminated soils and ground water from leaking USTs and ASTs; possible soil and ground er contamination from tannery operations; and soil contaminated with smelter wastes ılting in elevated heavy metal content. Chlorinated solvents (PCE) were discovered in eral monitoring wells and sampling performed during March of 1999 has confirmed the sence of PCE at concentrations above safe drinking water levels. However no source has n positively identified for these contaminants. Abandoned USTs of unknown use were ιoved from three locations during late 1998 and early 1999 (WALSH, 1999). Laboratory ιyses performed during the tank removals did not detect chlorinated solvents in either the : contents or surrounding soils. Analyses detected only diesel range hydrocarbons which cated that the tanks had probably stored fuel oil.

; investigation is intended determine if chlorinated solvents in ground water originate within ,ent or future CDOT right-of-way, or migrate onto CDOT ROW from unknown upgradient :ces. The potential human health and environmental risk will also be evaluated to determine need for remedial action.

ENVIRONMENTAL CONCERNS AND PROPOSED AREAS OF INVESTIGATION

location of the proposed monitoring wells are shown on Figure 2.

environmental concerns for this investigation are limited to defining contaminant source .tions of PCE in ground water and refining the known extent of contamination.

·IPLING AND ANALYSIS RATIONALE

LSH proposes to drill three additional test holes/monitor wells in the southeast (upgradient) of the project. Upgradient locations (TH-26, TH-27, and TH-28) should identify possible ite migration onto the property from the southeast. TH-26 will be located near the ROW ndary upgradient of TH-19 and is intended to determine if PCE concentrations in TH-19 inated on the property or migrated from industrial properties to the southeast. TH-27 and ·28 will be located upgradient of TH-24 which contains the highest concentrations of PCE cted in any test hole. One well (TH-13) in close proximity to TH-24 will be re-sampled to her assess a possible source within the project area. BW-13, which is near the ngradient project boundary, will be resampled to help determine the downgradient extent ontamination and possible impact to offsite receptors.

und water will be tested for VOCs and TEPH. Soil samples will be tested for VOCs, EX/MTBE, and TEPH.

ɜr levels will be surveyed in the wells to refine potentiometric surface maps and help ·mine flow directions and pathways.

SAMPLING METHODOLOGIES

Soil Sampling

location of the proposed test holes are shown on Figure 2. Monitor wells will be drilled to ɔth not to exceed 40 feet. Test holes will be drilled using 8-inch hollow stem continuous augers. Test holes will be monitored during drilling for both combustible gases and :s using a calibrated combustible gas indicator (CGI) and a calibrated photoionization :tor (PID). Sample headspace measurements will be taken using the PID to field screen 'OCs.

samples from all test holes will be collected at a maximum interval of 5 feet beginning at urface using a stainless-steel split spoon sampler. Discrete soil samples will be sent to the ·atory, depending on field observations. If field screening instruments do not indicate ɪminants and visual/olfactory indications of contamination are absent, a soil sample will be cted above the ground water/capillary zone for laboratory analyses. At least one sample ɔorehole will be collected. All samples will be collected in glass jars with Teflon-lined Samples will be kept on ice at 4 degrees Celsius (4° C) in coolers for delivery to the ·atory. Chain-of-custody records will be completed for each sample. Complete logs will ·epared for all test holes. Sample preservation is outlined in Table 2.

Ground Water Sampling

ınd water will be sampled through factory-slotted (screened) PVC pipe inserted in the test ;. Screened PVC sections will be installed from total depth to at least 2 feet above the : water table. Solid 2-inch PVC sections with a locking cap will be used to extend the :ned interval to the surface. Silica sand will be poured around the PVC to approximately 2 ɪbove the screen and bentonite chips added from the sand to approximately 1.5 feet below .urface to seal the annular space. Concrete will be used to secure a flush mount or steel up protective cover. Monitor wells will be developed by purging a minimum of 10 casing ɪnes of water. Prior to sample collection, the well head space will be measured for VOCs ʒ a PID and the standing water will be field tested during bailing for pH, conductivity and ›erature. The stability of these measurements and the total volume of water purged will :e that the ground water sample is representative of the formation. Ground water sampling ،s will be completed for each test hole.

ɔund water samples will be retrieved with a disposable polypropylene bailer and be collected analysis as follows: two 40-milliliter (ml) VOA vials for VOCs and BTEX; and one 1-r (L) glass bottles for TEPH. All samples will be placed immediately in an ice-filled cooler maintain a temperature of 4° C and delivered to the laboratory with complete chain-of-tody records. Table 1 outlines the containers and preservation techniques required for the ıples.

Surveying

: potentiometric surface of this area is known from previous studies. The ground level and ing elevations of newly installed piezometers will be recorded by global positioning system ?S) using the dual frequency method, as specified in the contract with CDOT. The GPS tem will also record the location and ground elevations of the test holes and shallow soil ıple sites.

LABORATORY ANALYSES

:ıples may be analyzed for BTEX/MTBE ,Total Extractable Petroleum Hydrocarbons :PH, diesel range hydrocarbons), and Volatile Organic Compounds (VOAs, EPA Method ;0). Table 1 presents the analyses, containers required, and preservation method for each lyte.

ɔle 2 outlines the analyses that are anticipated for the soil samples, the containers required, : the preservation techniques.

CHAIN-OF-CUSTODY

Chain-of-Custody record for each sample will track the possession and transfer of samples m time of field collection through laboratory analysis. The record will contain the owing information:

Sample tag number;
Signature of collector;
Date and time of collection;
Sample type (soil or ground water);
Identification of test hole or monitoring well;
Requested laboratory analyses;
Signatures of individuals in custody of the samples;
Dates and times of possession.

Table 1
Water Sample Methods, Containers and Preservatives

Analysis and Method	Container	Preservative
TEPH, EPA 8015	1-1L glass or nalgene	HCl, pH<2, Cool
TVPH, EPA 8015	2-40 ml VOA vials	HCl, pH<2, Cool
BTEX, EPA 8020	2-40 ml VOA vials	HCl, pH<2, Cool
VOAs, EPA 8260	2-40 ml VOA vials	HCl, pH<2, Cool
SVOAs, EPA 8270	1-1L amber glass	Cool
Total RCRA Metals, EPA 7000 et Seq., 6020 or ICP	1-1L HDPE	Field filtered, HNO_3, pH<2, Cool
Total Cyanide, EPA 335.2	1- 1L HDPE or glass	Add NaOH until pH>12, refrigerate in dark
pH, probe Alkalinity, EPA 310.1 TSS, EPA 160.2 TDS, EPA 160.1	1-1L HDPE	Cool
COD, EPA 410.1	1-250 ml HDPE	H_2SO_4, pH<2, Cool
Oil and Grease, EPA 413.1	2-1L amber glass	H_2SO_4, pH<2, Cool
Gross Alpha and Beta Radioactivity, SW 9310	1-1L HDPE	HNO_3, pH<2, Cool

TEPH - Total Extractable Petroleum Hydrocarbons
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
COD - Chemical Oxygen Demand
TDS - Total Dissolved Solids
SVOAs - Semi-volatile Organic Compounds
TVPH - Total Volatile Petroleum Hydrocarbons
RCRA - Resource Conservation and Recovery Act
TSS - Total Suspended Solids
VOAs - Volatile Organic Compounds

Table 2
Soil Sample Methods, Containers and Preservatives

Analysis and Method	Container	Preservative
TEPH, EPA 8015	1-4 or 8 oz glass	Cool
TVPH, EPA 8015	1-4 oz glass	Zero headspace, Cool
BTEX, EPA 8020	1-4 oz glass	Zero headspace, Cool
VOAs, EPA 8260	1-4 oz glass	Zero headspace, Cool
SVOAs, EPA 8270	1-4 oz glass	Cool
RCRA 8 Metals, EPA 7000 et. Seq., 6020 or ICP	1-8 oz. glass	None (Cool)
TCLP Non-volatiles	1-8 oz glass	Cool
Total Cyanide, SW 9010	1-8 oz glass	Cool

TEPH - Total Extractable Petroleum Hydrocarbons
RCRA - Resource Conservation and Recovery Act
SVOAs - Semi-volatile Organic Compounds
TVPH - Total Volatile Petroleum Hydrocarbons
TCLP - Toxicity Characteristic Leaching Procedure
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
VOAs - Volatile Organic Compounds

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROCEDURES

Purpose

ι for field measurements and laboratory analyses ensure data quality will withstand the utiny of litigation.

Data Quality Objectives

ta quality objectives include quantitation of the primary contaminant of concern to ιcentrations at or below applicable regulatory requirements. The most stringent applicable uirement for ground water is usually the maximum contaminant concentration (MCL) under Safe Drinking Water Act (SDWA). Laboratory analytical methods proposed in this SAP l meet the SDWA standard. The field and laboratory methods used in this project respond to Levels I and III (EPA, 1987), and are described below.

Level I - Field screening or analysis using portable instruments. Results are often not compound specific and not quantitative, but results are available in real-time.

Level III - All analyses performed in an off-site laboratory. Level III analyses may or may not use Contract Laboratory Program (CLP) procedures, but do utilize the validation or documentation procedures required of CLP Level IV analyses. According to EPA, Level III data is suitable for potential responsible party determinations.

Decontamination

l sampling equipment will be decontaminated following each split spoon sample. Hand ers will be decontaminated between each sample location. Decontamination of water ιpling equipment will be done between test holes. All sampling equipment will be washed h deionized water containing Alconox™ followed by a deionized water rinse. Drill augers l be steam cleaned between drilling of test holes.

ld personnel will wear rubber gloves at all times while handling samples. New gloves will donned at frequent intervals and following collection of grossly contaminated samples to uce the potential of cross-contamination.

9.4 Field Documentation

All field notes will be maintained in a bound field notebook or be recorded on appropriate field sampling forms. Notebook entries will be made in black ink; each page will be sequentially numbered, initialed, and dated. Field data will be included in the appendix of the final report with measurements in standard units.

9.5 Sample Preservation

Field sample preservation procedures are outlined above in Laboratory Analyses (Section 7.0). Samples will be maintained at a temperature of 4° C and promptly delivered to allow analysis with in the prescribed holding times.

9.6 Field Instrument Calibration

All field instruments will be calibrated daily. The pH and conductivity meter will be calibrated using commercially prepared pH and conductivity solutions. The PID and CGI will be adjusted to read the concentration (PID) or percentage (CGI) of bottled gas standards as described in the operating manuals. Calibration procedures will be documented in the field notebook.

9.7 Field and laboratory Quality Assurance/Quality Control (QA/QC)

QA/QC samples will include field blanks and blind duplicate samples obtained during sampling. Industry approved laboratories (WALSH, Analytica, or Environmental Chemistry Services) will perform the laboratory analysis of water and soil samples. The laboratory provides QA/QC data from spikes, blanks, trip blanks, replicates, and duplicates. All samples transmitted to the laboratories are handled according to strict chain-of-custody protocol. Laboratory analysis will be completed within prescribed holding times.

9.8 Final Report

To assure report quality, senior scientists will prepare draft and final reports. The final reviewer will be a principle of the firm who has not been involved in the site evaluation. The report will present the results of laboratory analysis of soil samples and ground water samples, geophysical conclusions and data, field observations, conclusions, and recommendations.

9.9 Control of Waste Materials

Contaminated soils and waters will be placed in DOT-approved containers. Drums will be transported to a site designated by the CDOT.

9.10 Health and Safety Plan (HASP)

A HASP has been developed for all field activities to be conducted during this investigation. Field personnel will be required to review, sign, and comply with all HASP provisions.

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